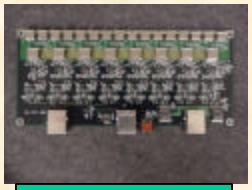
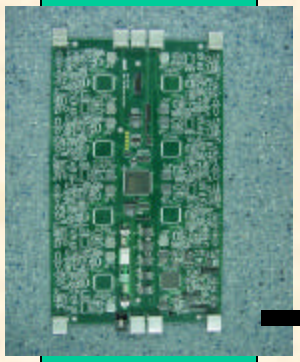
# Next Generation Hardware For Data Acquisition

LPSD bank of eight

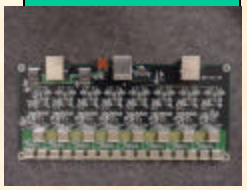


Preamp

LPSD tubes are banked in sets of eight tubes. High speed preamps amplify the signal. Total power consumption is about 14watts per bank. Standard CAT5 cabling is use rather than expensive custom cabling.
The ROC board (center) determines the position along the tube where the neutron is detected. It also time stamps the event. The information is then sent digitally to the FEM board via a LVDS copper connection.

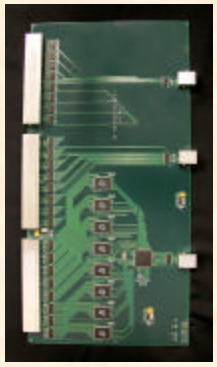


ROC Board



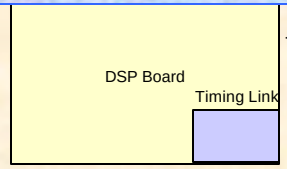
Send/Receive 1-8 ROCs

FEM Board



The FEM Board is a data concentrator. It receives information from up to eight ROC boards and sends the information along a single LVDS signal to the DSP board. The FEM Board also broadcasts timing signals and configuration information to the ROC boards.

The DSP Board receives neutron data from up to 8 FEM modules. It places the individual neutron events into "frames" and sends an entire frame to the preprocessor cluster over 1 to 4 fiber optical links. It also receives synchronization data and veto pulses from the timing module. A prototype board is nearing completion at BNL. The initial prototype will be used with BNL 2-D neutron detectors.




Send/Receive 1-8 FEMs

1-4 optical links

The Optical Communications card and the timing module (not shown) are placed in the preprocessor computer. The preprocessor is a P.C. and reflects the crate-less design of the data acquisition system. The optical communications board receives "frames" of neutron data every 16.667msec. The physical link can be an optical fiber or LVDS copper. Typically the copper link is used for testing or for prototypes. Because of its superior data rate (200MBytes/sec) and its galvanic isolation properties the optical link is used during standard operation.

Optical Communications Card

Optical Distribution Board

To/From Accelerator Systems

To/From Choppers

To/From Timing Module

The Data Acquisition architecture must deal with a variety of detector systems and with neutron detection rates over three orders of magnitude. To meet these goals, a scalable system of custom electronics has been designed. Digitization of the analog signals occurs very close to the front end of the electronics allowing the use of high speed digital communication hardware. Processing of the data is handled by a PC cluster know as the preprocessor. No crates are used in the Data Acquisition system, rather P.C.s and high speed optical communication cards are used to process and transfer information, providing an architecture that is scalable and cost effective.

The Optical Distribution Board sends real time digital signals from accelerator systems (for example the proton on target signal), and neutron choppers to the timing module that resides in the preprocessor cluster. Since the signals are sent optically, they are highly noise immune and signal detection is not compromised by large differences in ground potentials.